National Aeronautics and Space Administration

Office of Biological and Physical Research

LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE

February 15-16, 2001
NASA Headquarters
Washington, DC

MEETING REPORT

Steve Davison
Executive Secretary

Kenneth M. Baldwin
Chair

LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
NASA Headquarters
February 15-16, 2001

MEETING MINUTES
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Meeting Report Prepared by:
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LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
NASA Headquarters
February 15-16, 2001

Thursday, February 15

Welcome/Introductions

Dr. Kenneth Baldwin, Chair of the Life and Microgravity Sciences and Applications Advisory Committee (LMSAAC), called the meeting to order and welcomed members and attendees to the meeting. He introduced Dr. Mary Musgrave as the new Chair of the Life Sciences Advisory Subcommittee (LSAS), and Dr. J. Milburn "Kim" Jessup as the new Chair of the Space Station Utilization Advisory Subcommittee (SSUAS).

Review of LMSAAC Recommendations

Dr. Steve Davison, Executive Secretary of the LMSAAC, reviewed the responses to the recommendations from the last LMSAAC meeting in October:

1) Consolidation of the Research Budget – there is a Memorandum of Agreement (MOA) being drafted to consolidate the International Space Station (ISS) utilization and research budget into the science side of the house.
2) National Space Biomedical Research Institute (NSBRI) – Dr. Kathie Olsen presented an update on the site visit later in the meeting
3) Non-Government Organization (NGO) for management of Space Station utilization (numerous recommendations) – At this time, there is no decision to proceed with the NGO; there is an internal activity to assess cost, structure, etc. Mr. Uhran presented a detailed discussion of the NGO later in the meeting. The Architecture Study Committee Web site contains information on this subject.
4) Crew Training as a Limited Resource – The Space Station Payloads Operations Office recognizes this as a critical resource and is considering ways to minimize the impact of crew training.
5) Integrated Testing for External Payloads – Currently, there is no funded plan to involve the truss or external elements in multi-integration testing.
6) Flight Upgrades for ISS – The current integration activities are fairly complex; as the ISS program moves along, the activity should become more simplified and easier. The ISS Program has demonstrated flexibility in accommodating late changes and can work exceptions on a case by case basis; however, there will be certain hard "cut-off" dates (as close to launch as possible).
7) NASA Research Announcement (NRA) Policy – At this time, NASA will not include any fee for a commercial firm under a research grant.
8) Medical Operations/Health Care – The main mechanism for integrating these is through a Supplemental Medical Objective (SMO). NASA Headquarters has the final review on these activities. Dr. Paloski discussed this further in his presentation later in the meeting.
9) Office of Biological and Physical Research (OBPR) Enterprise – NASA is not considering consolidating all of the biological elements into one code (Enterprise); however, the Chief Scientist is currently focusing on the relationships between the

codes. With respect to cell biology, OBPR feels that an interdisciplinary approach is needed and does not want to "stovepipe" this important area into one division.
10) Commercial Activities in OBPR – The Enterprise agrees with the LMSAAC recommendation for a separate division for commercial activities and is moving forward to implement it.
11) Education – OBPR is taking action to strengthen its educational activities. Ms. Erickson addressed this topic later in the meeting.
12) NASA/NIH Collaboration – OBPR currently has 31 formal interagency agreements with a combination of federal agencies, national research foundations, and universities.
13) Radiation Health and Safety – This is one of NASA's highest priority activities. OBPR is currently formulating a focused program that integrates the research activities. Dr. Swain discussed this in her presentation later in the meeting.
14) Status of the ISS Program – OBPR will provide periodic updates and will have a briefing at the next meeting.
15) Alpha Magnetic Spectrometer (AMS) – Dr. Trinh will provide updates on this payload on a regular basis
16) Commercial Space Centers (CSC's) – Two CSC Directors presented briefings at this meeting.

OBPR Challenges and Management Activities

Dr. Olsen, Acting Associate Administrator for OBPR, introduced several new management people in the office—Ms. Kristen Erickson, Acting Associate Administrator for Management (responsible for budget, congressional affairs, etc.), Dr. Julie Swain, Acting Associate Administrator for Technical, and Dr. Baruch Blumberg, Senior Advisor for Biology for Mr. Goldin.

Dr. Blumberg noted that the Associate Administrator position has been posted and applications are due March 15. He is enlisting the help of the community outside of NASA in this endeavor. With respect to Astrobiology, Dr. Blumberg indicated that he initially thought that it should be included in OBPR; however, Dr. Weiler convinced him otherwise on both intellectual and fiscal grounds. Hopefully, what will happen is multiple sponsorship of astrobiology activities; this is happening—Code Y and Code U are each contributing $1 million to the Astrobiology budget. The affiliation with the NIH is a very important part of what OBPR is doing. There will be a seminar with the NIH on April 4 to acquaint the people at NIH with what is happening in Astrobiology.

The U.S. Laboratory, Destiny, has been added to the ISS and OBPR has been preparing for the era of ISS research. In terms of the strategic plan, OBPR is focusing on two questions: How do the fundamental laws of nature shape the evolution of life? How can humans expand beyond the home planet to achieve maximum benefits from space? The immediate priorities are: health and safety; ISS development and utilization; and excellent science and technology research. The vision for the next decade is to utilize ISS as a showpiece for space development, revolutionize medical care through advanced technology, dramatically reduce the cost of human exploration through advanced technology, and look at the challenges for human exploration. OBPR plans to develop

scientific "themes"—long term activities and research thrusts. The Enterprise is trying to focus the directed research (congressional earmarks) into something that fits within the OBPR mission. All of the research will be integrated with education and outreach. Dr. Baldwin expressed a concern about the increasing trend of Congressional earmarks and the impact to OBPR's budget.

Dr. Swain discussed the "10 Year Research Plan" for the ISS. The report on the Research Plan must be provided to Congress. This should drive a long-term Enterprise Plan. The office has started to look at "themes" for the increments. The process will include external expertise—advisory committees, discipline working groups, workshops, and National Research Council (NRC) reports. Another special project is the Radiation Program. The specific aims for 2001 are to: assess the radiation research efforts across the Agency; develop a Radiation Health Initiative; complete the radiobiology review; update the Code U Radiation Research Plan; create an Agency Radiation Plan; and implement recommendations.

Dr. Louis Ostrach from the Fundamental Biology Division discussed the Fundamental Space Biology Research Plan. The research strategy is to focus initially on ground research (cellular and subcellular organisms) and move to deep space. Focused research groups will identify areas that need to be developed. The program has a very strong emphasis on education and outreach.

Dr. Trinh, Director of the Physical Sciences Division, highlighted the directions in the physical sciences area. Basic areas have been represented in the Program: atomic and molecular physics, condensed matter physics, materials science, fluid physics, molecular biology, chemical engineering, microfluidics, and surface science. A Program has been developed to conduct basic research and deliver breakthrough technologies in bimolecular physics and chemistry. It will support bioastronautics, biotechnology, fundamental biology, and astrobiology.

Ms. Erickson discussed communication with the external community. There is a new Website: http://spaceresearch.nasa.gov. It contains electronic notices of important news, FAQs (under development), and an education page. There will be a quarterly OBPR Newsletter. The Pan Pacific Conference on Microgravity will be held May 1-4, 2001, in Pasadena. Other communication ideas are "Friends of OBPR" and press conferences for exciting research results. With respect to education, OBPR will focus efforts across the research divisions. It is addressing education at the K-12, university level, and lifelong learning. There are plans for a Focus Group Discussion in Summer 2001 with OBPR experts and the National Teachers Association in physics, biology, mathematics, and chemistry to better understand how the Enterprise can meet their needs. Mr. Erickson briefly discussed the reorganization and how the office is trying to restructure how to best work together to get the jobs done.

Dr. Olsen introduced the discussion on the advisory committee structure. The new Enterprise requires a new advisory committee structure that reflects the restructured organization. The current LMSAAC charter expires April 29, 2001. Dr. Olsen suggested

that the NASA-NIH Subcommittee be absorbed into the Biological, Biotechnology and Biomedical Advisory Subcommittee (BBBAS). The Subcommittees would be associated with science areas, rather than divisions, e.g., the BBBAS and Physical Sciences Advisory Subcommittee (PSAS), in addition to the existing SSUAS and Commercial Advisory Subcommittee (CAS). The LMSAAC had questions about the restructuring of the new organization and how applications and commercial activities would be handled. There was some concern about possible "stovepiping." Dr. Merrell observed that it was not clear how basic science would be transferred to applications, e.g., health. Dr. Davison indicated that this would be discussed more fully by Dr. Paloski on the following day. Ms. Erickson emphasized that in the new organization there is more interaction among the divisions; the directors have a "lessons learned" discussion among themselves. The goals are not mutually exclusive across the divisions.

Ms. Beth McCormick, currently the Deputy Associate Administrator in Policy and Plans and the Advisory Committee Management Officer, discussed some of the advisory committee administrative points. The charter for the LMSAAC should not lapse. Most advisory committee charters run for two years, although they can be updated and renewed in less than the two-year timeframe. With respect to Subcommittees, these are internally controlled but there is a section of the Committee's charter that refers to Subcommittees. Subcommittees are implemented through Terms of Reference. The Committee Charter must be signed by the Administrator. Dr. Baldwin noted that there is an issue about the leadership vacancies in the Enterprise; this may affect the committee structure. In response to a question, Ms. McCormick discussed some of the options for the Aerospace Medicine and Occupational Health Subcommittee (AMOHAS). Dr. Davison added that the AMOHAS would probably be associated with Code M in some fashion. Dr. Faeth indicated that it would be appropriate for the Committee to change its name, but did not think it would be wise to make any major changes immediately. As the organization becomes better aligned and settled over the next year, it would then be more appropriate to make some committee changes. Dr. Merrell opined that OBPR is a well managed organization, although it is currently in a state of flux due to the change in administration and the vacant Associate Administrator position.

Ms. Erickson reviewed the current baseline budget. No initiatives were funded unless they were campaign related. However, OPM and the Administration is very happy with the accomplishments of the organization. As noted, the plan is to transition the execution budget for ISS utilization in 2002 and both the formulation and the execution in 2003. In response to a question regarding the effect of the ISS cost growth, Ms. Erickson indicated that the ISS research budget is not under immediate threat. Finally, Ms. Erickson showed the listing of the Congressional earmarks from FY 2000 and FY 2001, totally almost $50 million.

Discussion:
Dr. Swain discussed what is "basic" and what is "applied" in the Enterprise. The Bioastronautics division is clearly 100% applied; other divisions have varying combinations of basic and applied research. To a large extent, the future direction will be personnel dependent. In response to a question, Ms. Erickson reviewed the current on-

board staffing. All of the Division Deputy positions are vacant (they are new positions held in the hiring freeze). Two of the Division Directors are acting. Dr. Blumberg's external committee will be evaluating as well as nominating Associate Administrator candidates. Dr. Faeth suggested that the LMSAAC might want to make recommendations on the relationship between OBPR and the Astrobiology Institute (and the relationships among Code Y, U and S), the new organization structure, the advisory committee structure, and where the commercial programs sit.

Science Talk: Developmental Biology

During lunch, Dr. Baldwin gave a science talk on muscle development in microgravity and the results of four spaceflight experiments. Muscle wasting is the number one disease facing mankind after the fourth decade. An interesting focus is how weight bearing plays a role in development of muscle. Dr. Baldwin started with providing some background on muscle physiology and biochemistry and discussed some of the ground-based work. Gravity was found to be an important factor for muscle differentiation during early development. On the Neurolab mission, young neonatal rats (7 and 14 days of age at launch) were flown in space for 16 days. This timeframe is a critical window in the development scheme of a rat. Both the normal and thyroid deficient animals experienced significant reduction in somatic growth by elimination of weight-bearing activity. The conclusions were that both weight bearing activity and thyroid hormone are necessary for normal body and muscle growth. Without normal weight bearing activity the muscle impairments likely reduce motor performance and functional capacity of the muscle system. Force is the critical variable for muscle mass.

OBPR Strategic Planning

Ms. Erickson reviewed the status of the strategic planning process. The NASA Plan was released in October 2000. The Ten-Year Plan is in development per congressional direction. Around the May/June timeframe, the office will be seeking LMSAAC inputs on the Biological and Physical Research Plan. The FY 2000 Performance Report is on its way to the printer. The FY 2001 Performance Plan is in implementation and the FY 2002 Plan is being finalized. The FY 2003 guidance has just been received and the approach appears unchanged.

In response to a comment from Dr. Olsen, Dr. Merrell and Dr. Baldwin clarified that their organizational concerns focused on a potentially precipitous change to the advisory committee structure. Dr. Baldwin felt that it would be prudent to go slow on changing the character of the LMSAAC and the subcommittees reporting to it. The LMSAAC wants to work closely with OBPR to do what it best for the Enterprise. There are some areas that do not have representation, e.g., astrobiology. The advisory structure needs to work with NASA to make the integration happen. Dr. Olsen noted that the Code S and Code Y committees have members that are part of the NASA Astrobiology Institute (NAI) or are astrobiologists.

Access to Space

Mr. Zwierko provided an update on current status of the Shuttle research missions. STS-107 is scheduled for launch on October 25, 2001. Crew training and payload processing

are in progress. There is a funding shortfall, but Code U is working with Code M and the discipline divisions to cover this. Triana has recently requested remanifesting on this flight. Doing this would result in loss of the Hitchhiker bridge and about 40+% of Code U payloads. Management will make a decision within two weeks. The HST launch may bump STS-107 to early 2002, but Code M is working hard to keep the launch in the 2001 timeframe. The only other research mission currently on the books is STS-112 (R2), currently shown on the manifest in the February 2003 timeframe. Candidate payload lists have been developed by the discipline divisions. Triana is currently considered as the unpressurized payload in the Orbiter bay. Congress has allocated $50 million for the mission. The R2 schedule is driven by the STS-107 schedule and turnaround processing. R2 is currently the last planned Shuttle sortie (standalone) research mission, and STS-107 decisions can directly affect R2.

Commercial Space Center Overvew

Dr. Frank Schowengerdt gave a presentation on the Center for Commercial Applications of Combustion in Space (CCACS), located at the Colorado School of Mines. CCACS partners are companies that make "everyday" products (not aerospace companies). Some of the products that the Center is focusing on include: water mist fire systems, catalytic gas turbines, gas-separation membranes, bone implant materials, ceramic products, and sensors. Some of the activities in the Center include payload development, e.g., the SpaceDRUMS ISS Containerless Processing Facility and the water mist insert in the Shuttle Combustion Module. In response to a question, Dr. Schowengerdt stated that the Center had its genesis out of industry driven research. There are eight active projects, all with formal industry partners. The NASA base funding is $1 million. Co-funding from industry, Colorado School of Mines, other federal agencies, etc., is $1.22 million; the in-kind funding totals $3.745 million. Last year, the Center supported 19 faculty members and 22 graduate students.

NGO Status and Consolidating ISS Utilization

Mr. Mark Uhran covered the status of the ISS Program, the budget consolidation, and the status of the NGO concept. One major deployment is underway now; this will be the first 10 racks into the U.S. Lab. It is critical to demonstrate productive user operation on the U.S. Lab. Over the next two years, OBPR is looking at mounting payloads on logistics missions to the station; this will allow for increased research opportunities. Thematic approaches are being developed for both the near term and long term. OBPR has selected about sixty experiments for the first five increments. Transfer of the ISS Research Program budget from the Human Space Flight appropriation account to the Science, Aeronautics, and Technology account is now proceeding in conjunction with the U.S. Lab deployment and research operations area. Formal approvals are projected for April 1, 2001. OBPR will have the responsibility to steward the Station for all users. There may be a significant restructuring of ISS research programs in response to fiscal and technical constraints. There will be more discussion on this topic at the next meeting (after the passback process). Dr. Olsen indicated that she would be attending the Senior Management Meeting on the following day to discuss the ISS cost growth issue. The most strategic area for investment is the ability to transport biological materials to and from the Station without power (passive). This would remove a major rate-limiting step

(powered middeck lockers). With respect to the NGO concept, OBPR is in a "hold" at present. The internal study is now complete. All nine of the affected organizations have responded with recommendations on which functions to transition to an NGO, the transition schedule, and associated rationale/criteria. The draft executive summary was just completed this week; however, the draft will not be distributed until after the principal Associate Administrators have a chance to work with it. There will be no changes to the current baseline until all elements are fully defined and understood by all parties. If there is a positive decision, the earliest schedule would be a draft RFP in the Summer 2001 and a final RFP in the Fall 2001. NASA must submit an implementation plan for options for managing the utilization of Space Station by September 2001.

NSBRI Site Visit Update

Dr. Olsen provided an update on the site visit/review of the NSBRI. The review was conducted November 29-December 1 and the report was completed on December 1. The NSBRI response to the review (implementation plan) is due February 15, 2001. Dr. Allan Tobin, Director of the Brain Research Institute, UCLA, was the Review Team Chair; there was wide diversity among the review team members. The Review Team was charged to look at the Institute's progress toward the development of countermeasures, the broader impacts of the NSBRI activity, and the effectiveness of the management. The Team recommended the continuation of the Institute. They felt that the research teams were very strong and the structure was very effective. One major concern was that the NSBRI would become a "funding" agency; they recommended that this clearly remain a NASA function. The NSBRI, NASA Headquarters, Ames Research Center (ARC), and Johnson Space Center (JSC), should work closer on goals. Finally, there was one unsuccessful area—diversity. The team, review panels, advisory panels, etc., did not reflect diversity in composition. The education element was very strong and exciting, but seemed independent of the research; there should be a greater integration of the two. Mr. Goldin was briefed on the findings and issues. Dr. Olsen is looking forward to seeing the response from NSBRI.

Subcommittee Reports

Dr. Jessup reported on the SSUAS meeting January 22-24 in Houston. The Subcommittee heard a number of updates and important issues. There was a holdover recommendation from the prior meeting that was not addressed—NASA has to do a better job in developing ties with grants management offices. Another "left-over" recommendation related to MELFI/Cryo and passive systems. In the new recommendations, the SSUAS recommended that Headquarters work to stop the deferral of funding for research. There was another recommendation about promoting Space Station awareness among the general public and capturing the imagination. There was a specific concern and recommendation on the lack of funding for biotechnology in OBPR. External sites was another topic—there was a question about the delivery of the Express pallet; the SSUAS recommended that a decision be made by April 1 and that the Program Office communicate firm plans on how the pallet would be built. Integrated testing was also a recommendation from the SSUAS; the ISS Program was requested to report back at the Summer meeting on electromagnetic interference from cables in the truss. One of the questions that the SSUAS had was the participation of Russian crew members as

subjects. Another issue was export control restrictions; these are impacting science planning and analysis activities. In response to a question from Dr. Olsen, Dr. Jessup noted that the two most important issues were the grants management and maintenance process and the lack of funding for biotechnology. Another concern with respect to the research process was reliability and stability of funds. The grants program should be scaled to fit a protected pool of funds. Dr. Olsen noted that General Armstrong has been tasked by the Administrator to focus on a "university initiative" and that she would try to connect him with the Committee to discuss some of these issues.

Ms. Porter reported on the CAS telecon meeting earlier in the week. In response to the criticism of LMSAAC and others about how NASA can allocate space on the ISS to commercial ventures without peer review, the Space Product Development (SPD) area has produced and distributed a set of metrics by which the commercial ventures' products will be valued. It was put together by a team lead by Dr. Glenn Spaulding. There is a product development score that gives weight to the product development levels, the time to market, the initial market potential, the private to total funding ratio, the total private investment, and required flight activity. There will be an evaluation panel of three members, including an active or recently retired corporate officer and two venture capitalists with active portfolios. CAS has approved this document. Another large advance in management is a set of SPD Program Principles; these were released in January. The commercial program has needed these foundation materials for some time, and they have been reviewed and discussed by the CSC Directors. These two excellent management tools are now in the system. The CAS supported the SSUAS recommendation for using the ISS for biotechnical research. Ms. Porter noted a couple of issues: setting some rules with respect to the Russian proposal for a "citizen explorer;" this is also needed on the commercial side. Dr. Olsen indicated that NASA is formulating a policy on this and it will be released to the Committee.

Dr. Musgrave relayed the frustration from the life sciences community on the 5% reduction in research grants, the low selection rates, and (in some cases) de-selections. The community also expressed interest in seeing some support again for the NRC post-doctoral program. The Committee discussed the issue of opportunities for selection for flight. If NASA wants to create a community for flight opportunities, it may be necessary to restructure things so that there isn't a financial penalty.

Before adjourning for the day, Dr. Baldwin identified several key issues:
- Status of AMOHAS and its new "home"
- The advisory committee infrastructure
- Oversight to ensure integration across biological sciences
- SSUAS recommendations
- Commercial Program infrastructure in OBPR
- Morale in the Research and Analysis Program

Friday, February 16, 2001

Medical Operations and Biomedical Research

Dr. Bill Paloski described the Bioastronautics organization at JSC. There are three offices that have responsibility for aspects of clinical and operational research—Space Medicine and Health Care Systems; Human Adaptation and Countermeasures; and Habitation and Environmental Factors. There are three standing projects: CCCDP, CHMRM, and the CEVP. Proposals and projects that come through these offices go through the SMO/Non-Advocate Review (NAR) process. This is a process for peer review of clinical activities. Once Headquarters approves a project, it comes back to JSC and is integrated into appropriate missions. These projects then begin competing with basic science projects for allocation of resources. A balance needs to be made among medical requirements, clinical/operational projects (SMOs), and science payloads. In response to a question, Dr. Paloski noted that the flight surgeons drive the medical requirements. Implementation takes the form of STS or ISS or analog environments. There are some ground-based SMOs, e.g., one will be looking at the incidence of cataract development in crewmembers. Dr. Borer noted the persistent concern about crewmembers taking medication, which could affect research results, without the knowledge of researchers. Dr. Paloski indicated that there are procedures for addressing this issue. Investigators can write this into the informed consent. Also, there is a clinical medical information system that is being populated with information. There is also a mechanism to do this retrospectively. Strides are being made in this direction. Historically, the flight surgeons were not very well informed about the research. As we are redefining clinical/operational research, physicians are more involved in the implementation of the research protocols. In the future, the flight surgeons will have better information on the research and the outcomes.

Dr. Paloski discussed the NAR process for clinical/operational research activities. Headquarters has a normal turnaround of 3 – 4 months, but can achieve a 2-month turnaround for critical projects. There is a set of 55 critical risks for space flight; these are broken into tiers: (1) no countermeasures for the problem; (2) a countermeasure concept, but no ground validation; (3) a countermeasure concept but no flight validation; and (4) an effective operational countermeasure. There is also a set of countermeasure readiness levels, from one to nine. Dr. Paloski described the countermeasure development process: investigator-initiated research; countermeasure development research; countermeasure testing; and countermeasure use. Flight surgeons are part of the process. The current funding in the CEVP project is about $4 million. The total number of long-duration crew members available for test is about 120; this is a very limited resource. Just last week, the Russians agreed that their crew would be available for science. This will double the pool. In response to a question, Dr. Tomko indicated that the NRA's for countermeasures research are released once a year. Most of the physiological issues do not come into play until return to the Earth environment. A lot of the countermeasures are oriented toward maintaining function so that people can perform nominally when returning. The Russians have actually taken the other approach (to build up muscle and bone after return). Many of the countermeasures are oriented toward getting to Mars and performing there. The Russians have learned that during the first

month of a long-duration mission, it does not matter whether countermeasures are done; they start countermeasures later in the flight timeline.

CSC Overview:
Medical Informatics and Technology Applications Consortium (MedITAC)
Dr. Ronald Merrell gave a presentation on MedITAC. It is a CSC under cooperative agreement with JSC, hosted by Virginia Commonwealth University-Medical College of Virginia. The mission of the CSC is to recruit technology, export technology, and make telemedicine practical. Dr. Merrell described the organization and NASA oversight. One of the projects on Devon Island was to evaluate and validate highly adapted technology into a PDA. Another partnership is in Kosova; it is using medical informatics and telecommunications technology to rebuild the health system of the country. MedITAC also works in Ecuador with a mobile medicine truck in remote environments to develop electronic medical records and use telecommunication devices. Home health care is much like the ISS. MedITAC is currently working with Microsoft to integrate medicine and lifestyle when a patient goes home. NASA asked MedITAC to work with Russia on telemedicine. MedITAC has a modular telemedicine course, which was given at JSC. There are a number of outreach activities, including discipline specific symposia and 35 presentations in 12 countries. Dr. Merrell described the Virginia Biotechnology Development Center (VBDC) Business Model. MedITAC's leverage from the NASA grant ranges from 1.3:1 to 2.5:1. Expectations in 2001 are higher. Visit MedITAC's Website at: http://meditac.com.

Division Directors Status Reports
Dr. Tomko provided a brief update on the Bioastronautics Division. It is starting to formulate its identity—staffing needs and interaction with other divisions in Code U. The Division has met with JSC and NSBRI to discuss a shared vision for the biomedical program.

Dr. David Liskowsky provided an update on the Fundamental Space Biology (FSB) Division. The NRA for ground-based research was released in October 2000 and 153 proposals were received. The flight research solicitation is expected to be released April 1. FSB participated in the Astrobiology Institute 2001 selection process; Code U will be contributing $1 million. There is a joint (UF/UG) cell science Principal Investigator (PI) meeting in March in Houston. Five FSB experiments have been manifested on STS-107; a tissue share activity is planned. FSB is considering up to five experiments for flight on R2. The LMSAAC was pleased with the positive step to bring investigators together at the joint cell workshop. In the future, the Division would like to see the cellular investigators get together with the physiologists. In terms of the science, there is less overlap with Code Y. Dr. Olsen is thinking about having an agency-level biology coordinating committee. The LMSAAC requested further briefings on this type of infrastructure.

Dr. Trinh provided an update on the Physical Sciences Division. The Physical Sciences Research Program includes fundamental microgravity research, biomolecular physics and chemistry, and biotechnology and Earth-based applications. Dr. Trinh discussed some

specific issues in ISS research. The Division has planned a set of facilities for multi-investigator use: the Fluids and Combustion Facility, the Materials Science Research Facility, the Low Temperature Microgravity Physics Facility, the Biotechnology Research Facility, and the X-Ray Diffraction Facility. Currently, the Division is emphasizing Express sub-rack payloads. Dr. Trinh described the modifications to the flight program plan. The Division is deferring the second and third materials sciences racks and starting a new sub-rack level furnace assembly. It is restructuring the macromolecular crystallization program to defer the structural biology test until crystal handling and cryo-preservation capabilities are developed and coordinated with the commercial program for the x-ray diffraction unit. A Biotechnology Facility for the modified Human Research Facility (HRF) rack is being developed and the Microgravity Glovebox facility is being enhanced. The Division is proposing to restructure the NRA process—shorten the period between opportunities, increase opportunities for cross-disciplinary research, prioritize research, and increase average grant funding. The proposed approach is for a single, annual NRA with two opportunities to submit proposals per year. In addition, there would be periodic focused cross-disciplinary thrust areas. The Division would like to start the new cycle next year. What is unchanged is the rigorous and unbiased peer review process. Dr. Trinh also discussed the proposed advisory subcommittee restructuring. The Microgravity Research Advisory Subcommittee (MRAS) would become the Physical Science Advisory Subcommittee; all of the relevant disciplines would be included. At the same time, the Division would like to create some associated Task Groups with more disciplinary and interdisciplinary focus.

Discussion and Committee Recommendations

The LMSAAC commended the OBPR interim leadership and staff for professionalism and effectiveness during this time of transition.

The Committee developed recommendations on the following topics: the reorganization of the advisory committee structure; the NSBRI review; the AMOHAS; administrative fractionation in biology-biomedical sciences; PI morale; post doctoral opportunities; physical and chemical research; and medical operations and biomedical research. In addition, the LMSAAC adopted three of the recommendations from the SSUAS: stabilize research funding; research vision support; and facilities to support the new Enterprise for biotechnology.

The LMSAAC decided to carry the following recommendations forward to the NAC:
- the reorganization of advisory committee structure
- stabilizing research funding (and PI morale)

The final recommendations are included in Appendix D.

Dr. Baldwin adjourned the meeting at noon. The next LMSAAC meeting is tentatively scheduled for May 17-18, 2001, at NASA Headquarters.

AGENDA
MEETING OF THE
LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
(LMSAAC)
NASA Headquarters, Room 6H46
(MIC 6 – West Side)

THURSDAY – February 15, 2001

10:00 A.M.	Welcome/Chair's Review of Agenda/Logistics	Dr. Baldwin
10:05 A.M.	Review of LMSAAC Recommendations	Dr. Davison
10:20 A.M.	OBPR Challenges and Management Activities AA Search Status Program Advocacy Communication with External Community Organizational Structure Budget and Congressional Status Scientific Research Plans Outreach and Education Plans	Dr. Olsen/Dr. Blumberg Ms. Erickson/Dr. Swain Division Directors
11:30 A.M.	Committee Discussion/OBPR Challenges and Management Activities	
12:30 P.M.	Working Lunch: Developmental Biology Presentation	Dr. Baldwin
1:15 P.M.	OBPR Strategic Planning	Ms. Erickson
1:30 P.M.	Access to Space	Mr. Zwierko
1:45 P.M.	Commercial Space Center Overview: Center for Commercial Applications of Combustion in Space	Dr. Schowengerdt
2:15 P.M.	NGO Status and Consolidating ISS Utilization	Mr. Uhran
3:10 P.M.	NSBRI Site Visit Update	Dr. Olsen
3:30 P.M.	Subcommittee Reports Space Station Utilization Advisory Subcommittee (SSUAS) NASA-NIH Advisory Subcommittee (NASA-NIH) Aerospace Medicine & Occupational Health (AMOHAS) Commercial Advisory Subcommittee (CAS) Life Sciences Advisory Subcommittee (LSAS) Microgravity Research Advisory Subcommittee (MRAS)	 Dr. Jessup Dr. Borer Dr. Merrell Ms. Porter Dr. Musgrave Dr. Russell
4:45 P.M.	Committee Discussion/Writing Assignments Preliminary Action Items	LMSAAC/ Dr. Baldwin
5:30 P.M.	Adjourn	
6:30 P.M.	Committee Dinner: Barolo Restaurant, 223 Pennsylvania Avenue, S.E. (202) 547-5011	

AGENDA

MEETING OF THE
LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
(LMSAAC)
NASA Headquarters, Room 6H46
(MIC 6 – West Side)

FRIDAY – February 16, 2001

8:00 A.M.	Medical Operations and Biomedical Research	Dr. Paloski/Dr. Swain/ Dr. Williams
8:40 A.M.	Commercial Space Center Overview: Medical Informatics and Technology Applications Consortium	Dr. Merrell
9:10 A.M.	Division Directors' Status Reports	
	Bioastronautics Research	Dr. Fogleman
	Fundamental Space Biology	Dr. Liskowsky
	Physical Sciences	Dr. Trinh
9:40 A.M.	Chair's Comments/Review of Agenda Discussion and Committee Recommendations	Dr. Baldwin
12:00 P.M.	Adjourn	

LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
Membership List
May 2000

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LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
NASA Headquarters
February 15-16, 2001

MEETING ATTENDEES

Committee Members:

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Bigelow, Nicholas	University of Rochester
Borer, Jeffrey	Cornell University Center
Bula, Raymond	[not affiliated]
Chang, Ester	Georgetown University Medical Center
Daley, Thomas	Philadelphia Naval Business Center
Davison, Steven (Executive Secretary)	NASA Headquarters
Faeth, Gerard	University of Michigan
Freeman, Colette	National Cancer Institute
Gross, Leroy	INTEL MED Inc.
Hill, Walter	Tuskegee University
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McPherson, Alexander	University of California, Irvine
Merrell, Ronald	Medical College of Virginia/VCU
Musgrave, Mary	University of Massachusetts
Porter, Elsa	Meridian International Institute
Russel, William Bailey	Princeton University
Sanders, Jay	Global Telemedicine Group

NASA Attendees:

Ahlf, Peter	NASA Headquarters
Beck, Beth	NASA Headquarters
Carpenter, Brad	NASA Headquarters
Chambers, Larry	NASA Headquarters
Cintron, Nitza	NASA/JSC
Collier, James	NASA Headquarters
Connell, Kathleen	NASA/ARC
Crouch, Roger	NASA Headquarters
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Gardner, Rebecca	NASA Headquarters
King, Merrill	NASA Headquarters
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Shepanek, Marc	NASA Headquarters
Shortz, Donna	NASA Headquarters
Stigberg, Ellen	NASA Headquarters
Tomko, David	NASA Headquarters
Trinh, Eugene	NASA Headquarters

Other Attendees:

Askew, Ray	Texas A&M
Guastaferro, Carl	InDyne, Inc.
Hather, Bruce	USRA
Monjan, Andrew	NIA/NIH
Mumford, Geoff	American Psychological Association
O'Neill, John	USRA
Ryan, Maureen	Spacehab
Schowengerdt, Frank	CCACS
Stabekis, Perry	Lockheed Martin

LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
NASA Headquarters
February 15-16, 2001

FINDINGS AND RECOMMENDATIONS

Reorganization of Advisory Committee Structure [to NAC]
Finding: The reorganization to the current OBPR structure requires a corresponding reorganization of the advisory committee structure.

Recommendations:
1. Continue the advisory committee structure with the parent committee called the Biological and Physical Research Advisory Committee (BPRAC);
2. Absorb the current NASA-NIH Advisory Subcommittee into the Biological, Biotechnology and Biomedical Advisory Subcommittee (BBBAS);
3. Aerospace Medicine and Occupational Health Advisory Subcommittee (AMOHAS) transferred to Code M;
4. New Physical Sciences Advisory Subcommittee (PSAS) to replace the current Microgravity Research Advisory Subcommittee (MRAS);
5. Continuation of the Space Station Utilization Advisory Subcommittee (SSUAS) and the Commercial Advisory Subcommittee (CAS).
6. LMSAAC also recommends continuation of the Discipline Working Groups or similar Task Groups as part of an informal advisory committee infrastructure.

Stabilize ISS Research [to NAC]
Finding: There is now a permanent human presence on ISS and with the launch of the U.S. Laboratory there is now an expansion of scientific investigation and a need for a stable research program that must function in spite of construction overruns or other unanticipated expenses.

Recommendation: Now that the U.S. Laboratory is in orbit NASA should stop the deferral of scientific/experimental hardware funding and stabilize the funding to ensure ISS research facility development and deployment.

OBPR PI Morale
Finding: The Committee noted a number of issues that are negatively affecting PI morale including low selection rates for funding, a shortage of flight opportunities, de-selection of flight experiments, and a recent 5% cut to all ongoing OBPR investigations. Such practices discourage new investigators from applying to the program and alienate established investigators. Further, the highly visible efforts currently underway to expand NASA relations with universities are undermined and contradicted by these realities. Moreover, the science and technology enabled by OBPR are essential for NASA's mission.

Recommendation: OBPR should provide sustained support of ground-based and flight research in order to foster the growth of a cadre of investigators who will bring forward the mission of the new enterprise. OBPR funding rates must be made competitive with those of other federal agencies.

NSBRI Review

Findings: The LMSAAC was briefed on NASA's review of the National Space Biomedical Research Institute (NSBRI) Program, in which an external Review Committee enthusiastically recommended continuation of the NSBRI.

Recommendations: The LMSAAC concurs with NASA's decision to continue the mission of the NSBRI. The Committee requests NASA's response to the report of the External Review Committee as well as further briefings as to how the NSBRI will implement the recommendations provided by the External Review Committee. Further, the LMSAAC encourages both NASA and the NSBRI to explore mechanisms to extend grant duration to NSBRI researchers in order to enhance the continuity and synergy of counter measure-related research projects.

Research Vision Support

Finding: Recent NRC reports have stressed the need for NASA to broaden its contact with the external research community. Increasing participation from the research communities through NASA funded programs is important for ISS. NASA has done a good job initiating outreach activities to national organizations in different disciplines, but the grants management approach could be improved.

Recommendation: NASA should improve its grants management service in: (a) stability and magnitude of funding, (b) streamlining its review procedures, (c) firm commitment to timelines for releasing NRA's, funding and activation of grants, and (d) improving its relationship with academic and commercial grants management offices.

Facilities to Support the New Enterprise for Biotechnology

Finding: The creation of the new enterprise Office of Biological and Physical Research, the recent hiring of Dr. Blumberg, and the creation of a novel microsensor program with NIH generate enthusiasm for enhanced support of biology and biotechnology within NASA and on International Space Station. Part of the original premise for Station was that biotechnology and biology research would be a major component of the Space Station research program.

Recommendation: The LMSAAC requests that NASA present a full report on facilities to support biology and biotechnology on the Space Station.

Aerospace Medicine and Occupational Health Subcommittee (AMOHAS)
Finding: The AMOHAS is no longer an appropriate subcommittee for LMSAAC

Recommendations:
1) The aerospace medicine aspect of AMOHAS as an advisory resource should follow Space Medicine to Code M.
2) Clinical medicine should continue to have a liaison on the successor to LMSAAC.
3) A role for advisors to support the CMO should be considered with regard to policy for both aerospace medicine and occupational health.

Administrative Fractionation in Biology-Biomedical Sciences
Findings: The NASA life sciences program is divided among several codes, including Codes U and S and, now, the new Astronaut Medical Care Office. On numerous occasions during the past 4 years, the Committee has been briefed on activities of the existing components and has concluded that communications among these entities is relatively poor. Given the paucity of budgetary resources for research in these related entities, the Committee repeatedly has recommended integration of all biology-related activities. NASA has rejected integration within a single code but has not provided an alternative to optimize communications and scientific interaction among all biology and biomedically-related activities.

Recommendations:
1) Simultaneous with the planned reorganization of biology and biomedically-related activities in a new enterprise, NASA must create a workable plan for interdisciplinary communication and interaction.
2) The interaction should be at both management and investigator levels.
3) The plan should include quantifiable measurements to assure compliance and accountability.
4) The Committee requests a report of progress toward this plan at its next meeting.

Post Doctoral Opportunities
Finding: Past programs (NASA Space Biology Research Associate Program and NRC Fellows) that provided support to PhD's seeking post-doctoral training in space life sciences were effective in introducing young scientists to the discipline and making the pursuit of NASA-related research part of their professional careers. In the absence of these programs, the only mechanism for post-doctoral training is through funding in a PI's research grant.

Recommendation: The OBPR should re-institute post-doctoral training in a way that allows individual students to compete for training opportunities in PI labs and at NASA centers. A training program that cultivates a sense of belonging to the larger discipline will be effective in recruiting and retaining scientists. This will quickly provide a pipeline of well-trained people to contribute to the OBPR mission.

Physical and Chemical Research
Finding: Since the Office of Biological and Physical Research was created in the fall of 2000, there has been a continuing effort to sharpen the vision for the Enterprise and this vision increasingly emphasizes life and biological science.

Recommendation: The LMSAAC recommends that NASA continue to place a strong emphasis on fundamental research which extends our understanding of the physical and chemical world (see Strategic Plan OBPR Goal #2).

Medical Operations and Biomedical Research
Finding: LMSAAC applauds efforts underway to integrate operational medicine and clinical research activities. The Non-Advocate Review process, as envisioned, is especially commendable. The Committee understands this is a work in progress and some processes and outcome measures are undefined.

Recommendations: LMSAAC requests regular briefings on progress in implementing this important program with particular attention to how this process will foster linkages between basic, applied research, and operational medical activities. In addition, the committee requests a report on the specific mechanisms to ensure that clinical research data are made available to investigators.

Office of Biological and Physical Research (OBPR)
Finding: OBPR is undergoing rapid changes which are stressful to the staff. However, the enterprise seems to be splendidly managed and in excellent preparation for the arrival of permanent leadership.

Commendation: LMSAAC commends OBPR interim leadership and staff for professionalism and effectiveness.

LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
NASA Headquarters
February 15-16, 2001

LIST OF PRESENTATION MATERIAL[1]

1) Office of Biological and Physical Research [Olsen]
2) Presentation to the Life and Microgravity Sciences and Applications Advisory Committee – LMSAAC Recommendations [Davison]
3) LMSAAC: STS 107 and R2 (STS-112) Status Update [Zwierko]
4) Center for Commercial Applications of Combustion in Space [Schowengerdt]
5) NSBRI Review Briefing to the LMSAAC [Olsen]
6) International Space Station Status Report [Uhran]
7) Medical Informatics and Technology Applications Consortium [Merrell]
8) Fundamental Space Biology Division Update [Liskowski]
9) Physical Science Research – Earth-Based and Flight Program [Trinh]

Other material distributed at the meeting:

1) The Spacelab Accomplishments Program (CD ROM)
2) Call for Paper – 2nd Pan-Pacific Basin Workshop on Microgravity Sciences, 2001
3) Appropriations and Authorizations language on Space Station research utilization and commercialization
4) Space Product Development Program Principles
5) Product Development Evaluation Metrics
6) *Washington Post* article on Med-Tel technology – "Expanding the Research of the Healing Touch"
7) CCACS Information Package
8) Senior Executive Service Vacancy Announcement: Associate Administrator for OBPR
9) NASA Space Radiation Research Working Group (NSRR) Charter

[1] Presentation and other material presented at the meeting are on file at NASA Headquarters, Code U, Washington, DC 20546.